

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
29 July 2004 (29.07.2004)

PCT

(10) International Publication Number
WO 2004/064342 A1

(51) International Patent Classification⁷: **H04L 12/56**

(21) International Application Number:
PCT/KR2004/000047

(22) International Filing Date: 13 January 2004 (13.01.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
03101605.7 13 January 2003 (13.01.2003) CN

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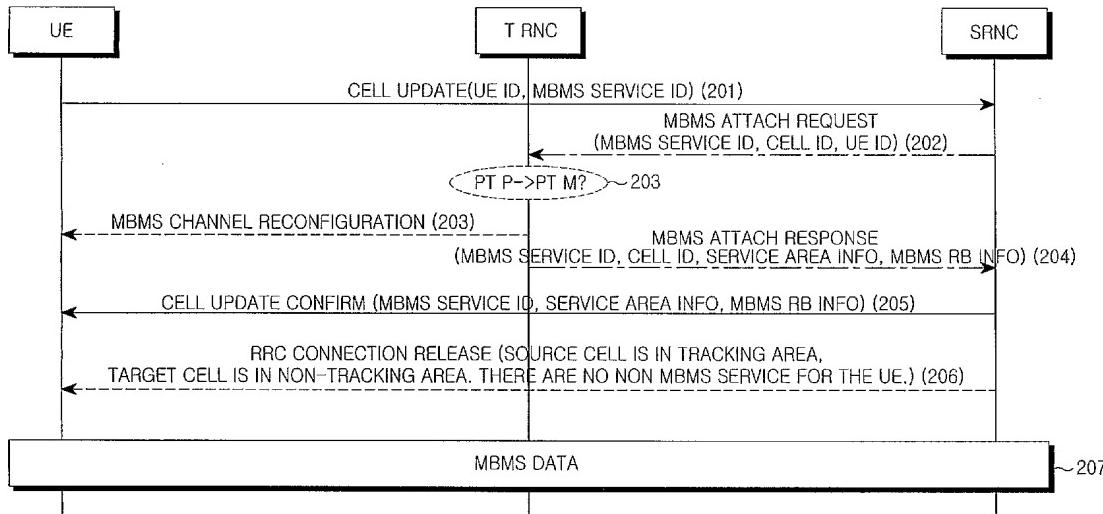
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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(54) Title: MOBILITY METHOD FOR UE IN RRC CONNECTED MODE



WO 2004/064342 A1

(57) Abstract: A mobility method for a UE receiving a MBMS service in the state of CELL_FACH or CELL_PCH from one cell to another in RRC connected mode comprising: a step of sending a message of "Cell Update" to a new cell by the UE; a step of sending a "MBMS connection request" containing such information as a MBMS Service ID, a UE Identity and a Cell ID to a target cell by a RNC once it receives a message of "Cell Update" from the UE applying for the MBMS service and if the UE moves between different cells within the same RNC; a step of sending a message of "MBMS Channel Reconfigure" by the RNC to all UEs within the cell once the type of channel of a cell switches from PTP to PTM due to addition of the UE; a step of sending a message of "MBMS connection response" to the SRNC by the RNC; a step of sending a message of "Cell Update Affirm" to the UE by the RNC.



- (84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

— *with international search report*

MOBILITY METHOD FOR UE IN RRC CONNECTED MODE**BACKGROUND OF THE INVENTION**5 **1. Field of the Invention**

The invention relates to a Wideband Code-Division Multiple Access (simplified as WCDMA) mobile communication system, especially to a mobility method for UE in RRC connected mode.

10 **2. Description of the Related Art**

Multimedia Broadcast and Multicast Service (simplified as MBMS) is a new service under standardization by 3rd Generation Partnership Project (simplified as 3GPP). MBMS service is a unidirectional point-to-multipoint (p-t-m) service, whose most remarkable feature is that it can make use of radio resources and network resources efficiently.

Figure 1 describes a structure of a MBMS system. The MBMS network structure, based on the core network of General Packet Radio Service (simplified as GPRS), has been added with new network units. Following is the description of the MSMS system structure in Figure 1.

20 Broadcast and Multicast Service Center (simplified as BM-SC) 101 is a service control center of the MBMS system. Gateway GPRS Supporting Node 102 (simplified as GGSN) and Service GPRS Supporting Node 103 (simplified as SGSN) compose a transmission network for MBMS service and provide a route for data transfer. UMTS Terrestrial Radio Access Network 104 (simplified as UTRAN) provides radio resources for the MBMS service over the air-interface. User Equipment 105 (hereinafter simplified as UE) is a terminal device for data receiving. Home Location Register 106 (hereinafter simplified as HLR) stores the data related to user and can provide services such as user authentication. Uu107 is a radio interface, and Iu108 denotes an interface between an access network and a core network. In the figure, other parts except UE compose an infrastructure field (herein after simplified as IF). Radio resources used by MBMS service are not dedicated for one user, but for all users using the service.

In the case that no MBMS service is introduced in a WCDMA communication system, if a UE in the states of CELL_FACH and CELL_PCH

- 2 -

reselects the cell, it sends a message of "Cell Update" to a new cell after it moves from one cell to another. When the UTRAN requests the UE in the state of CELL_DCH to perform such operations as adding of radio connections, deleting of radio connections and both of them on an active set of a connection according to a survey report of the UE, it will send a message of "Active Set Update " to the UE.

There is no MBMS service relevant parameter in the existing updating message of cell. When a UE in the states of CELL_FACH and CELL_PCH reselects a cell, neither does it know whether the new cell is a tracking area or a non-tracking area, nor does it know the parameters related to radio bearer (simplified as RB) after it moves from one cell to another. If it waits for receiving broadcast or paging message, it will be losing data inevitably. Not only the same problem as above will happen to the UE which is kept in the state of CELL_DCH when it updates the active set, but also that from which cell or cells of the active set the UE receives MBMS service will come across. Thus, the known standards can not deal with the mobility problem of the user receiving a MBMS service in a mobile communication system.

SUMMARY OF THE INVENTION

An object of the invention is to provide a mobility method for a UE receiving MBMS service in RRC connected mode from one cell to another. In virtual of the mobility method provided in the present invention, loss of data can be reduced when the user moves between different cells and the UE can be informed clearly whether the new cell is a tracking area or a non-tracking area.

To achieve the object mentioned above, a mobility method for a UE receiving a MBMS service in the state of CELL_FACH or CELL_PCH from one cell to another in RRC connected mode according to the invention comprising:

(a) a step of sending a message of "Cell Update" by the UE to a new cell, wherein a information element of the MBMS Service ID has been added to the message;

(b) a step of sending a message of "MBMS Connection Request" containing such information as MBMS Service ID, UE Identity and Cell ID by a RNC to a target cell once it receives the message of "Cell Update" from the UE applying for the MBMS service, and if the UE moves between different cells within the same RNC, the step can be skipped over;

- 3 -

(c) a step of sending a message of "MBMS Channel Reconfigure" to all UEs within the cell by the RNC when the type of a channel of the target cell switches from PTP to PTM due to addition of the UE;

5 (d) a step of sending a message of "MBMS Connection Response" containing such information as MBMS Service ID, UE Identity, Cell ID, MBMS RB Info and Service Area Info by the RNC to a SRNC;

(e) a step of sending a message of "Cell Update Affirm" containing such information as MBMS Service ID, MBMS RB Info and Service Area Info by the RNC to the UE ; and

10 (f) a step of releasing the corresponding RRC connection, if a source cell where the UE not receiving any other non-MBMS service locates is a tracking area and the target cell is a non-tracking area.

The invention has dealt with the mobility problem for the UE receiving the MBMS service in RRC connected mode in the known mobile communication system. With the signaling flow provided in the present invention, data loss resulted from the mobility of the UE between the cells can be reduced. And the UE can be notified whether the new cell is a tracking area or a non-tracking area in time. Therefore, the signaling transmission over the air interface is reduced, and the radio resource is saved and the efficiency is improved for the system in offering MBMS service. And the modifications of the available messages have backward compatibility.

BRIEF DESCRIPTION OF THE DRAWINGS

25 The above and other features and advantages of the present invention will be more apparent from the following detailed description taken in conjunction with the accompanying drawings, in which identical components are indicated by identical reference numbers and symbols throughout the several views:

Figure 1 is a logic figure of a network device for offering MBMS service;

30 Figure 2 shows a signaling flow for UE receiving a MBMS service in the states of CELL_FACH and CELL_PCH when it moves in the same SGSN;

Figure 3 shows a signaling flow for UE receiving a MBMS service in the state of CELL_DCH when it moves in the same RNC;

35 Figure 4 shows a signaling flow for UE receiving a MBMS service and other non-MBMS service simultaneously in the state of CELL_DCH when it moves between different RNCs;

Figure 5 shows a signaling flow for UE receiving a MBMS service only in the state of CELL_DCH when it moves between different RNCs.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

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Hereinafter, the invention will be described in detail in reference to the accompanying drawings.

10 (1) According to the invention, a method for dealing with a mobility problem of a UE receiving MBMS service in the states of CELL_FACH and CELL_PCH comprising:

15 a) After moving from one cell into another, the UE receiving the MBMS service in the states of CELL_FACH and CELL_PCH send a message of "Cell Update" to a new cell. And an information element of the MBMS Service ID has been added in the message;

20 b) If the UE moves between different Radio Network Controllers (hereinafter simplified as RNC), once a Service RNC (hereinafter simplified as SRNC) receives the message of "Cell Update" from the UE applying for the MBMS service, it sends a message of "MBMS Connection Request" to a RNC of a target cell. The message of "MBMS Connection Request" contains such information as MBMS Service ID, UE Identity and Cell ID.

25 c) Once a channel of the target cell switches from Point-to-Point (hereinafter simplified as PTP) to Point-to-Multipoint (hereinafter simplified as PTM) due to addition of the UE, the RNC sends a message of "MBMS Channel Reconfigure" to all UEs within the cell. The message contains such information as MBMS Service ID, MBMS RB Info and Service Area Info (e.g., a tracking area or a non-tracking area). The Service Area Info is optional.

30 d) If step (b) exists in the method, a Drifting RNC (hereinafter simplified as DRNC) sends a message of "MBMS Connection Response" to the SRNC. The message contains such information as MBMS Service ID, UE Identity, Cell ID, MBMS RB Info and Service Area Info (e.g., a tracking area or a non-tracking area);

35 e) The RNC of the target cell sends a message of "Cell Update Affirm" to the UE. The message is added with such information as MBMS Service ID, MBMS RB Info and Service Area Info (e.g., a tracking area or a non-tracking area). Therefore, the UE can obtain the information on a MBMS RB and the service area quickly so as to intercept the MBMS data from the relevant channels.

- 5 -

f) If a source cell where the UE locates is a tracking area and the target cell is a non-tracking area, and the UE does not receive any other non-MBMS service, then the corresponding RRC connection is released.

- g) Now the UE can receive MBMS data from the new cell.
- 5 h) If the UE moves between two different cells within the same RNC, step (b) and (d) can be skipped over.

(2) According to the invention, a mobility method for a UE receiving a MBMS service in the state of CELL_DCH when it moves between two different cells within the same RNC comprising:

10 a) A UE receiving MBMS service in the state of CELL_DCH sends a message of "Survey Report" to a RNC (Rel99).

15 b) A RNC decides whether to update an active set (both a source cell and a target cell have radio links (hereinafter simplified as RL)) or to perform a cell-changing procedure (the target cell is the one with PTM mode, and no other non-MBMS service for the UE, or no real active set updating procedure but changing the MBMS service). Because the cells are arranged by quality (from good to poor, the first cell is the best in its quality) in a cell list of the survey report, the RNC can select one cell or more with the best quality to provide a MBMS service.

20 If the active set has a plurality of RLs, the RNC should select a threshold value to prevent the cell offering MBMS service from changing continually. When the Signal-to-Noise Ratio (SNR) or the power of the received signal code of a cell in the active set is higher than that of the original cell providing the MBMS service by this threshold value, the RNC changes the cell providing the 25 MBMS service. The RNC can also add a timer for switching the cell which offers MBMS service on condition that the Signal-to-Noise Ratio (SNR) exceeds the threshold value within a time period.

30 If both the source cell and the target cell have the RL (e.g., the UE receives other non-MBMS services), the RNC also can switch the cell offering MBMS service each time it updates the active set only.

35 c) If the target cell is a tracking area and its channel switches from PTP (Point-to-Point) to PTM (Point-to-Multipoint) due to addition of the UE, the RNC sends a message of "MBMS Channel Reconfigure" to all UEs within the cell. The message contains such information elements as MBMS Service ID, MBMS RB Info and Service Area Info (e.g., the tracking area or the non-tracking area).

- 6 -

d) If the UE only receives MBMS service and the target cell is a non-tracking area or a tracking area in PTM mode, the RNC sends a message of "RB Reconfigure" or "Physical Channel Reconfigure" to notify the UE that whether the new cell is a tracking area or a non-tracking area, the RB parameters and to delete the RL of the source cell.

If the UE receives non-MBMS service and the target cell is a non-tracking area or a tracking area under PTM mode, then before the RNC establishes the RL for the non-MBMS service, it can send the message of "RB Reconfigure" or "Physical Channel Reconfigure" to notify the UE that whether the new cell is a tracking area or a non-tracking area and the RB parameters. Therefore, loss of data can be reduced.

The message of "RB Reconfigure" or "Physical Channel Reconfigure" is added with such information elements as MBMS Service ID, MBMS RB Parameters, Service Area Info. All these information elements are optional.

Once the UE completes the relevant configurations, it sends a message of "RB Configuration Complete" or "Physical Channel Configuration Complete" to the RNC according to the received message.

e) If the active set updates or the target cell operates in PTP mode when the UE receives non-MBMS service, the RL and RB are established for the target cell to complete the synchronization on the user plane.

f) If the active set is updated or the target cell operates in PTP mode when the UE receives non-MBMS service, the RNC sends a message of "Active Set Update" to the UE. The message is added with such information elements as MBMS Service ID, MBMS RB Parameters and Service Area Info. All these information elements are optional.

Once the UE completes the relevant configurations, it sends a message of "Active Set Update Complete" to the RNC.

g) If it is needed to delete the RL of the source cell according to the survey report of the UE, then delete the RL of the source cell.

Now, the UE can receive the MBMS data from the new cell.

(3) According to the invention, a mobility method for a UE receiving a MBMS service between different RNCs as well as a non-MBMS service in the state of CELL_DCH comprising:

- 7 -

a) The UE receiving the MBMS service in the state of CELL_DCH sends a message of " Survey Report" to a RNC (Rel99).

A SRNC decides to execute whether an Active Set Update process or a Cell Update process. The conditions for MBMS cell selection and execution are the same as in (2).

b) The SRNC sends a message of "MBMS Connection Request" to the RNC of a target cell. The message of "MBMS Connection Request" contains such information as MBMS Service ID, UE Identity and Cell ID.

c) If the target cell is a tracking area and its channel switches from PTP (Point-to-Point) to PTM (Point-to-Multipoint) due to addition of the UE, the RNC sends a message of " MBMS Channel Reconfigure " to all UEs within the cell. The message contains such information elements as MBMS Service ID, MBMS RB Info and Service Area Info (e.g., the tracking area or the non-tracking area).

d) A DRNC sends a message of "MBMS Connection Response" containing such information as MBMS Service ID, UE Identity, Cell ID, Service Area Info and MBMS RB Info to the SRNC. The MBMS RB Info is optional and if the target cell is a tracking area in PTP mode, RB information won't be included.

e) If the target cell is a non-tracking area or a tracking area in PTM mode, then before the RNC establishes the RL for the non-MBMS service, it can send a message of "RB Reconfigure " or " Physical Channel Reconfigure " to notify the UE that whether the new cell is a tracking area or a non-tracking area and the RB parameters. Therefore, data losses can be reduced. The message of " RB Reconfigure " or " Physical Channel Reconfigure" contains such information elements as MBMS Service ID, MBMS RB Parameters and Service Area Info.

Once the UE completes the relevant configurations, it sends a message of "RB Configuration Complete" or "Physical Channel Configuration Complete" to the RNC according to the received message.

f) The RL and RB establishment processes on Iur (the interface between SRNC and DRNC) and Iub (the interface between RNC and BS subsystem) to accomplish uplink/downlink synchronization on the user plane are performed. If only change the cell receiving the MBMS service within active set and the cell is in PTM mode, the step can be skipped over.

g) The SRNC sends a message of "Active Set Update" to the UE. The message contains such information elements as MBMS Service ID, MBMS RB Parameters and Service Area Info. If only change a cell receiving the MBMS

- 8 -

service within active set and the cell is in PTM mode, the step can be skipped over.

Once the UE completes the relevant configurations, it sends a message of "Active Set Update Complete" to the RNC.

5 h) If it is needed to delete the RL of the source cell according to the survey report of the UE, then delete the RL of the source cell.

(4) According to the invention, a mobility method for dealing with a UE receiving a MBMS service in the states of CELL_FACH and CELL_PCH comprising:

10 a) The UE receiving the MBMS service in the state of CELL_DCH sends a message of " Survey Report" to a RNC (Rel99).

A SRNC decides to execute whether an Active Set Update process or a Cell Update process.

15 b) The SRNC sends a message of "MBMS Connection Request" to the RNC of the target cell. The message of "MBMS Connection Request" contains such information as MBMS Service ID, UE Identity and Cell ID.

c) If the target cell is a tracking area and its channel switches from PTP (Point-to-Point) to PTM (Point-to-Multipoint) due to addition of the UE, the RNC sends a message of " MBMS Channel Reconfigure " to all UEs within the cell.

20 d) The RNC sends a message of "MBMS Connection Response" containing such information as MBMS Service ID, UE Identity, Cell ID, Service Area Info and MBMS RB Info to the SRNC. The MBMS RB Info is optional. If the target cell is a tracking area in PTP mode, RB information won't be included.

25 e) If the target cell is a non-tracking area or a tracking area in PTM mode, the RNC sends a message of " RB Reconfigure" or "Physical Channel Reconfigure " to notify the UE that whether the new cell is a tracking area or a non-tracking area and the RB parameters.

Once the UE completes the relevant configurations, it sends a message of "RB Configuration Complete" or "Physical Channel Configuration Complete" to the RNC according to the received message.

30 f) If the target cell is a tracking area in PTP mode, the RL and RB establishment processes to accomplish uplink/downlink synchronization on the user plane are performed.

- 9 -

g) If the target cell is a tracking area in PTP mode, RNC sends a message of "Active Set Update" to UE. The message contains such information elements as MBMS Service ID, MBMS RB Parameters, Service Area Info.

Once the UE completes the relevant configurations, it sends a message of "Active Set Update Complete" to the RNC.

h) If it needs to delete the RL of the source cell according to the survey report of the UE as well as the RB information of the target and source cell, then delete the RL of the source cell.

The signaling flow of the mobility of the UE receiving MBMS service in the states of CELL_FACH and CELL_PCH is shown in Figure 2:

201 After moving from one cell into another, a UE receiving the MBMS service in the states of CELL_FACH and CELL_PCH sends a message of "Cell Update" to a new cell. And the information element of MBMS Service ID has been added in the message.

202 If the UE moves between cells in different RNC, after a SRNC receives a message of "Cell Update" from the UE applying for MBMS service, it sends a message of "MBMS Connection Request" to a RNC of the target cell. The message of "MBMS Connection Request" contains such information as MBMS Service ID, UE Identity and Cell ID.

203 Once the type of a channel of the cell switches from PTP (Point-to-Point) to PTM (Point-to-Multipoint) due to addition of the UE, the RNC sends a message of "MBMS Channel Reconfigure" to all UEs within the cell.

204 If the UE moves between different cells within different RNCs, a DRNC sends a message of "MBMS Connection Response" containing such information as MBMS Service ID, UE Identity, Cell ID, MBMS RB Info and Service Area Info (e.g., a tracking area or a non-tracking area) to the SRNC.

205 The RNC sends a message of "Cell Update Affirm" to the UE. The message is added with such information as MBMS Service ID, MBMS RB Info and Service Area Info (e.g., a tracking area or a non-tracking area). Therefore, the UE can obtain the information on the MBMS RB and the service area quickly so as to intercept the MBMS data from the relevant channels.

206 If a source cell where the UE locates is a tracking area and the target cell is a non-tracking area, and UE does not receive any other non-MBMS service, then the corresponding RRC connection is released.

207 Now, the UE can receive the MBMS data from the new cell.

- 10 -

If the UE moves between two different cells within the same RNC, step 202 and 204 can be skipped over.

The signaling flow for the mobility of the UE receiving MBMS service between two different cells of the same RNC in CELL_DCH state is shown in
5 Figure 3:

301 A UE receiving the MBMS service in the state of CELL_DCH sends a message of "Survey Report" to a RNC (Rel99).

10 302 RNC decides to execute whether an Active Set Update process (both a source cell and a target cell have a RL) or a Cell Update process (the target cell is in PTM mode and the UE isn't receiving other non-MBMS service, or only the cell within the active set is updated to receive MBMS service). RNC can select the cell for providing the MBMS service.

15 303 If the target cell is a tracking area and its channel switches from PTP (Point-to-Point) to PTM (Point-to-Multipoint) due to addition of the UE, the RNC sends a message of "MBMS Channel Reconfigure" to all UEs within the cell.

20 304 If the UE only receives MBMS service and the target cell is a non-tracking area or a tracking area in PTM mode, the RNC sends a message of "RB Reconfigure" or "Physical Channel Reconfigure" to notify the UE that whether the new cell is a tracking area or a non-tracking area, the RB parameters and to delete the RL of the source cell.

25 If the UE receives non-MBMS service and the target cell is a non-tracking area or a tracking area in PTM mode, then before the RNC establishes the RL for the non-MBMS service, it can send the message of "RB Reconfigure" or "Physical Channel Reconfigure" to notify the UE that whether the new cell is a tracking area or a non-tracking area and the RB parameters. Therefore, loss of data can be reduced.

305 If step 304 exists, the UE completes the relevant configurations, and sends a message of "RB Configuration Complete" or "Physical Channel Configuration Complete" to the RNC according to the received message.

306 If the active set is updated or the target cell operates in PTP mode when the UE receives non-MBMS service, the RL and the RB are established for the target cell to complete synchronization on the user plane.

307 If the active set is updated or the target cell operates in PTP mode when the UE receives non-MBMS service, the RNC sends a message of " Active Set

- 11 -

Update" to the UE. The message is added with such information elements as MBMS Service ID, MBMS RB Parameters and Service Area Info.

308 If step 307 exists, once the UE completes the relevant configurations, it sends a message of "Active Set Update Complete" to the RNC.

5 309 If it is needed to delete the RL of the source cell according to the survey report of the UE, then delete the RL of the source cell.

310 Now, the UE can receive the MBMS data from the new cell.

10 The signaling flow for mobility of the UE receiving the MBMS service as well as the non-MBMS service between different RNCs in the state of CELL_DCH is shown in Figure 4.

401 A UE receiving the MBMS service in the state of CELL_DCH sends a message of "Survey Report" to a RNC (Rel99).

15 402 A SRNC decides to execute whether an Active Set Update process or a Cell Update process. The condition for MBMS cell selection and execution is the same as above.

403 The SRNC sends a message of "MBMS Connection Request" to the RNC of the target cell. The message of "MBMS Connection Request" contains such information as MBMS Service ID, UE Identity and Cell ID.

20 404 If the target cell is a tracking area and its channel switches from PTP (Point-to-Point) to PTM (Point-to-Multipoint) due to addition of the UE, the RNC sends a message of "MBMS Channel Reconfigure" to all UEs within the cell.

25 405 A DRNC sends a message of "MBMS Connection Response" containing such information as MBMS Service ID, UE Identity, Cell ID, Service Area Info and MBMS RB Info to the SRNC. The MBMS RB Info is optional and if the target cell is a tracking area in PTP mode, RB information won't be included.

30 406 If the target cell is a non-tracking area or a tracking area in PTM mode, then before the RNC establishes the RL for the non-MBMS service, it can send a message of "RB Reconfigure" or "Physical Channel Reconfigure" to notify the UE that whether the new cell is a tracking area or a non-tracking area and the RB parameters. Therefore, loss of data can be reduced.

407 If step 406 exists, once the UE completes the relevant configurations, it sends a message of "RB Configuration Complete" or "Physical Channel Configuration Complete" to the RNC according to the received message.

- 12 -

408 The RL and the RB establishment processes on Iur and Iub interfaces are performed to accomplish uplink/downlink synchronization on the user plane. If only change a cell within the active set for receiving MBMS service and the cell is in PTM mode, the step can be skipped over.

5 409 The SRNC sends a message of "Active Set Update" to the UE. The message contains such information elements as MBMS Service ID, MBMS RB Parameters and Service Area Info. If only change a cell within active set for receiving MBMS service and the cell is in PTM mode, the step can be skipped over.

10 410 Once the UE completes the relevant configurations, it sends a message of "Active Set Update Complete" to the RNC. If only change a cell within active set for receiving MBMS service and the cell is in PTM mode, the step can be skipped over.

411 If it needs to delete the RL of the source cell according to the survey report of the UE, then delete the RL of the source cell.

15

The signaling flow for mobility of the UE only receiving the MBMS service between different RNCs in the state of CELL_DCH is shown in Figure 5.

501 A UE receiving the MBMS service in the state of CELL_DCH sends a message of "Survey Report" to a RNC (Rel99).

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502 A SRNC decides to execute whether an Active Set Update process or a Cell Update process.

503 The SRNC sends a message of "MBMS Connection Request" to the RNC of a target cell. The message of "MBMS Connection Request" contains such information as MBMS Service ID, UE Identity and Cell ID.

25

504 If the target cell is a tracking area and its channel switches from PTP (Point-to-Point) to PTM (Point-to-Multipoint) due to addition of the UE, the RNC sends a message of "MBMS Channel Reconfigure" to all UEs within the cell.

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505 A DRNC sends a message of "MBMS Connection Response" containing such information as MBMS Service ID, UE Identity, Cell ID, Service Area Info and MBMS RB Info; to the SRNC. The MBMS RB Info is optional. If the target cell is a tracking area in PTP mode, RB information won't be included.

506 If the target cell is a non-tracking area or a tracking area in PTM mode, the RNC sends a message of "RB Reconfigure" or "Physical Channel Reconfigure" to notify the UE that whether the new cell is a tracking area or a non-tracking area

- 13 -

and the RB parameters. The message contains with such information elements as MBMS Service ID, MBMS RB Parameters and Service Area Info.

507 If step 506 exists, once the UE completes the relevant configurations, it sends a message of "RB Configuration Complete" or "Physical Channel Configuration Complete" to the RNC according to the received message.

508 If the target cell is a tracking area in PTP mode, then the RL and RB establishment processes to accomplish uplink/downlink synchronization on the user plane are performed.

509 If the target cell is a tracking area in PTP mode, the RNC sends a message of "Active Set Update" to the UE. The message contains with such information elements as MBMS Service ID, MBMS RB Parameters and Service Area Info.

510 If step 509 exists, once the UE completes the relevant configurations, it sends a message of "Active Set Update Complete" to the RNC.

511 If it needs to delete the RL of the source cell according to the survey report of the UE as well as the RB information of the target and the source cell, delete the RL of the source cell.

While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the following claims.

WHAT IS CLAIMED IS:

1. A mobility method for a UE receiving a MBMS service in the state of CELL_FACH or CELL_PCH from one cell to another in RRC connected mode comprising:

a) a step of sending a message of "Cell Update" containing the information element MBMS Service ID by the UE to a new cell;

b) a step of sending a message of "MBMS Connection Request" to a target cell by a RNC once it receives the message of "Cell Update" from the UE, and if the UE moves between different cells in the same RNC, the step can be skipped over;

c) a step of sending a message of " MBMS Channel Reconfigure" to all UEs within the cell by the RNC once the type of a channel of the cell switches from PTP to PTM due to addition of the UE;

d) a step of sending a message of "MBMS Connection Response" by the RNC to a SRNC;

e) a step of sending a message of "Cell Update Affirm" by the RNC to the UE; and

f) a step of releasing the corresponding RRC connected if a source cell where the UE not receiving any other non-MBMS service locates is a tracking area and the target cell is a non-tracking area.

2. The method according to Claim 1, wherein an information element of Service Area Info is added to said message of "MBMS Connection Response".

3. The method according to Claim 1, wherein the information element of Service Area Info is added to said message of "Cell Update Affirm".

4. The method according to Claim 1, wherein said message of "MBMS Channel Reconfigure" comprises the information elements of MBMS Service ID, MBMS RB Info and Service Area Info.

5. A mobility method for a UE in the state of CELL_DCH between different cells within the same RNC in RRC connected mode comprising:

a) a step of deciding to execute an Active Set Update process or a Cell Update process by a RNC;

- 15 -

b) a step of sending a message of "MBMS Channel Reconfigure" to all UEs within the cell by the RNC if a target cell is a tracking area and its channel switches from Point-to-Point to Point-to-Multipoint due to addition of the UE;

c) a step of sending a message of "RB Reconfigure" or "Physical Channel Reconfigure" by the RNC to notify the UE that whether the new cell is a tracking area or a non-tracking area, the RB parameters, and to delete the RL of a source cell if the UE only receives the MBMS service and the target cell is a non-tracking area or a tracking area in PTM mode, and sending a message of "RB Configuration Complete" or "Physical Channel Configuration Complete" to the RNC according to the received message by the UE once it completes the relevant configurations;

d) a step of performing the RL and RB establishment processes by the UE if an active set is updated or the target cell operates in PTP mode when the UE receives non-MBMS service for the target cell to accomplish the synchronization on the user plane;

e) a step of sending a message of "Active Set Update" to the UE by the RNC if the active set is updated or the target cell in PTP mode when the UE receives non-MBMS service;

f) a step of sending a message of "Active Set Update Complete" to the RNC by the UE once the UE completes the relevant configurations; and

g) a step of deleting the RL of the source cell if it needs to delete the RL of the source cell according to the survey report of the UE.

6. The method according to Claim 5, wherein said step (c) further comprising:

a step of sending the message of "RB Reconfigure" or "Physical Channel Reconfigure" by the RNC before it establishes the RL for the non-MBMS service to notify the UE whether that the new cell is a tracking area or a non-tracking area and the RB parameters if the UE receives non-MBMS service and the target cell is a non-tracking area or a tracking area in PTM mode at the same time.

7. The method according to Claim 5, wherein the RNC selects one or more cells with the best quality to provide MBMS service from the active set according to the survey report of the UE.

8. The method according to Claim 7, wherein the RNC gives a threshold for avoiding continually updating of the cell providing the MBMS service when the SNR or receiving signal code power of a cell in the active set is higher than that

- 16 -

of the cell providing MBMS service by the threshold, the RNC changes the cell for providing MBMS service.

9. The method according to Claim 8, wherein the RNC sets a timer and when the threshold is exceeded within a certain time period, the RNC changes the cell for providing MBMS service.

5 10. The method according to Claim 7, wherein if both the source cell and the target cell have the RLs, the RNC can only change the cell for providing MBMS service each time when executing active set updating.

10 11. The method according to Claim 5, wherein the information elements added to said message of "RB Reconfigure" comprise MBMS Service ID, MBMS RB Parameters and Service Area Info.

11 12. The method according to Claim 5, wherein the information elements added to said message of "Physical Channel Reconfigure" comprise MBMS Service ID, MBMS RB Parameters and Service Area Info.

15 13. The method according to Claim 5, wherein the information elements added to said message of "Active Set Update" comprise MBMS Service ID, MBMS RB Parameters and Service Area Info.

16 14. The method according to Claim 5, wherein said message of "MBMS Channel Reconfigure" comprises information elements of MBMS Service ID, MBMS RB Info and Service Area Info.

17 15. A mobility method for a UE receiving a MBMS service as well as a non-MBMS service in the state of CELL_DCH between different cells within different RNCs in RRC connected mode comprising:

18 a) a step of deciding to execute an Active Set Update process or a Cell Update process by a SRNC;

19 b) a step of sending a message of "MBMS Connection Request" to a RNC of a target cell by the SRNC;

20 c) a step of sending a message of "MBMS Channel Reconfigure" to all UEs within the cell by the RNC if the target cell is a tracking area and its channel switches from Point-to-Point to Point-to-Multipoint due to addition of the UE;

21 d) a step of sending a message of "MBMS Connection Response" to the SRNC by a DRNC;

- 17 -

e) a step of performing RL and bearer establishment processes on Iur and Iub interfaces to accomplish uplink/downlink on the user plane and if only change a cell within an active set for receiving the MBMS service or the cell is in PTM mode, the step can be skipped over;

5 f) a step of sending a message of "Active set Update" to the UE by the SRNC and if only change to a cell within an active set for receiving the MBMS service or the cell is in PTM mode, the step can be skipped over, and sending a message of "Active Set Update Complete" to the RNC by the UE once it completes the relevant configurations; and

10 g) a step of deleting the RL of the source cell if it needs to delete the RL of the source cell according to the survey report of the UE.

16. The method according to Claim 15, wherein between the step (d) and the step (e), i.e. after the SRNC receives the message of "MBMS Connection Response" from a DRNC,

15 if the target cell is a non-tracking area or is a tracking area in PTM mode, sending a message of "RB Reconfigure" or "Physical Channel Reconfigure" to the UE by the RNC before establishing the RL for the non-MBMS service to notify the UE whether the new cell is a tracking area or a non-tracking area as well as of the RB parameters, and finishing the corresponding configuration and sending the message of "RB Reconfigure Complete" or "Physical Channel Reconfigure Complete" to the RNC by the UE according to the message received, then executing the step (e).

20 17. The method according to Claim 15 or 16, wherein the information elements added to said message of "RB Reconfigure" comprise MBMS Service ID, MBMS RB Parameters and Service Area Info.

18. The method according to Claim 15 or 16, wherein the information elements added to said message of "Physical Channel Reconfigure" comprise MBMS Service ID, MBMS RB Parameters and Service Area Info.

25 19. The method according to Claim 15 or 16, wherein the information elements added to said message of "Active Set Update" comprise MBMS Service ID, MBMS RB Parameters and Service Area Info.

30 20. The method according to Claim 15, wherein said message of "MBMS Channel Reconfigure" comprises information elements of MBMS Service ID, MBMS RB Info and Service Area Info.

- 18 -

21. The method according to Claim 15, wherein an information element Service Area Info is added to said message of "MBMS Connection Response".

22. The method according to Claim 15, wherein, in said message of "MBMS Connection Response", MBMS RB Info is optional and if the target cell is a tracking area in PTP mode, RB information won't be included.

5 23. A mobility method for the UE only receiving the MBMS service in the state of CELL_DCH between different cells within different RNCs in RRC connected mode comprising:

10 a) a step of deciding to execute an Active Set Update process or a Cell Update process by a SRNC;

 b) a step of sending a message of "MBMS Connection Request" to a RNC of a target cell by the SRNC ;

15 c) a step of sending a message of " MBMS Channel Reconfigure " to all UEs within the cell by the RNC if the target cell is a tracking area and its channel switches from Point-to-Point to Point-to-Multipoint due to addition of the UE;

 d) a step of sending a message of "MBMS Connection Response" to the SRNC by a DRNC;

20 e) a step of sending a message of " RB Reconfigure" or "Physical Channel Reconfigure " to notify the UE that whether the new cell is a tracking area or a non-tracking area and the RB parameters by the RNC if the target cell is a non-tracking area or a tracking area in PTM mode, and sending a message of "RB Configuration Complete" or "Physical Channel Configuration Complete" to the RNC according to the received message by the UE once it completes the relevant configurations;

25 f) a step of performing the RL and the RB establishment processes to accomplish uplink/downlink synchronization on the user plane if the target cell is a tracing area in PTP mode;

30 g) a step of sending a message of "Active Set Update" to the UE by the RNC if the target cell is a tracing area in PTP mode, and sending the message of "RB Configuration Complete" or "Physical Channel Configuration Complete" to the RNC according to the received message by the UE once it completes the relevant configurations; and

 h) a step of deleting the RL of the source cell if it needs to delete the RL of the source cell according to the survey report of the UE .

35 24. The method according to Claim 23, wherein the information elements

- 19 -

added to said message of “RB Reconfigure” comprise MBMS Service ID, MBMS RB Parameters and Service Area Info.

25. The method according to Claim 23, wherein the information elements added to said message of “Physical Channel Reconfigure” comprise MBMS Service ID, MBMS RB Parameters and Service Area Info.

5 26. The method according to Claim 23, wherein the information elements added to said message of “Active Set Update” comprise MBMS Service ID, MBMS RB Parameters and Service Area Info.

10 27. The method according to Claim 23, wherein said message of “MBMS Channel Reconfigure” comprises information elements of MBMS Service ID, MBMS RB Info and Service Area Info.

28. The method according to Claim 23, wherein an information element Service Area Info is added to said message of “MBMS Connection Response”.

15 29. The method according to Claim 23 wherein, in said message of “MBMS Connection Response”, MBMS RB Info is optional and if the target cell is a tracking area in PTP mode, RB information being not included.

30. The method according to one of the Claim 4, 14, 20 and 27, wherein the Service Area Info in said message of “MBMS Channel Reconfigure” is optional.

20 31. The method according to one of the Claim 11, 17 and 24, wherein the information elements of MBMS Service ID, MBMS RB Parameters and Service Area Info in the message of “RB Reconfigure” are optional.

25 32. The method according to one of the Claim 12, 18 and 25, wherein the information elements of MBMS Service ID, MBMS RB Parameters and Service Area Info in the message of “Physical Channel Reconfigure” are optional.

33. The method according to one of the Claim 13, 19 or 26 wherein the Information elements of MBMS Service ID, MBMS RB Parameters and Service Area Info in the message of “Active Set Update” are optional.

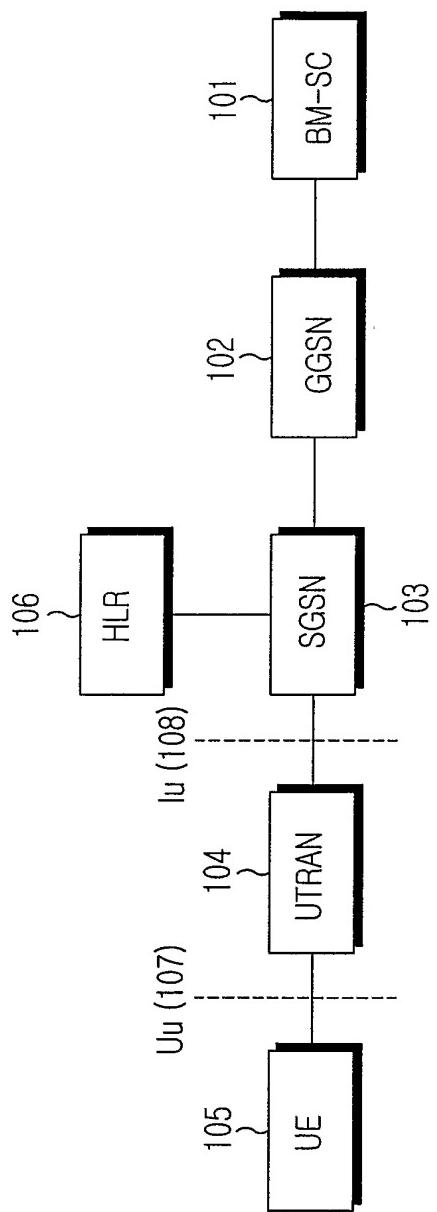


FIG. 1

2/5

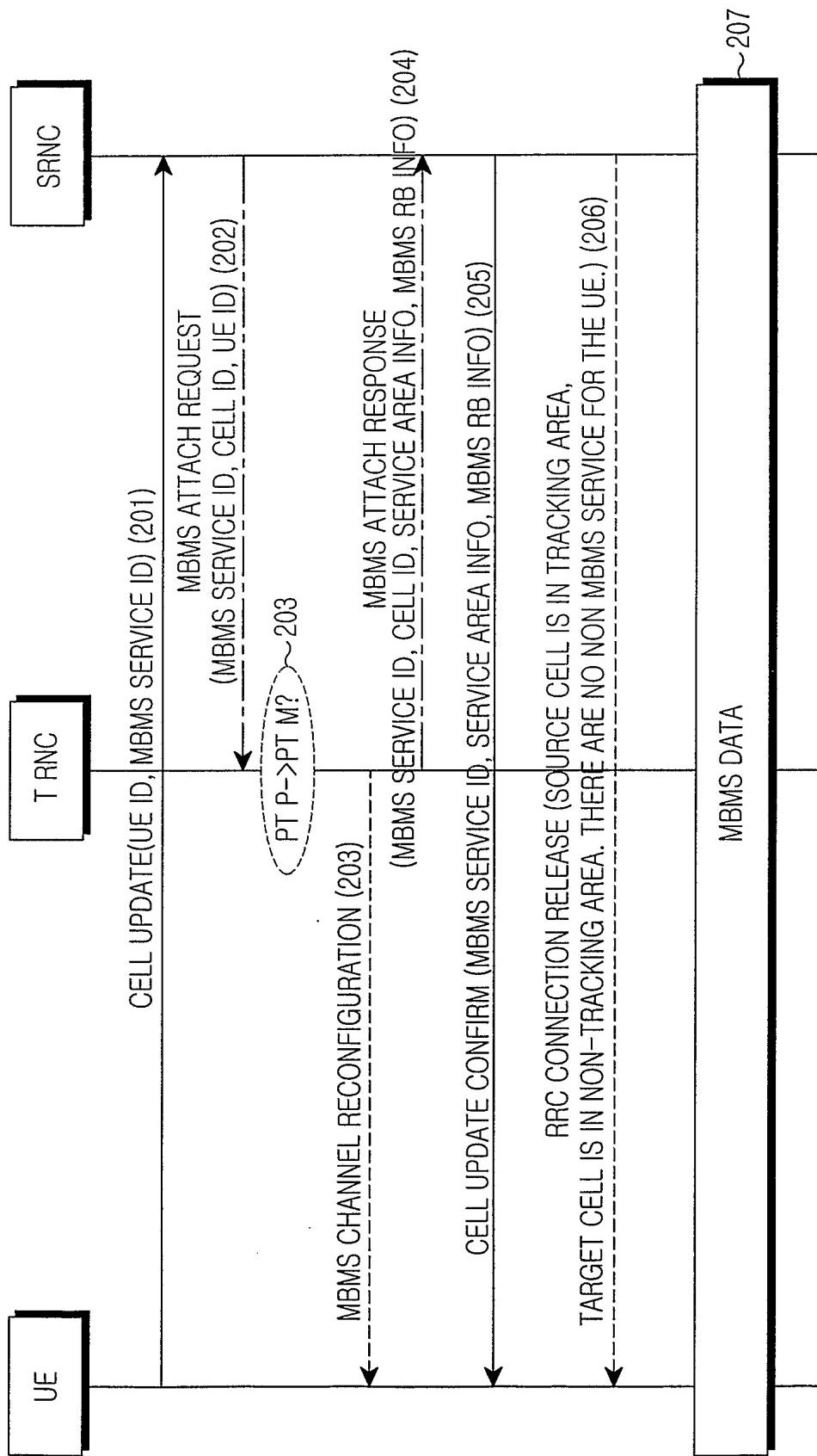


FIG.2

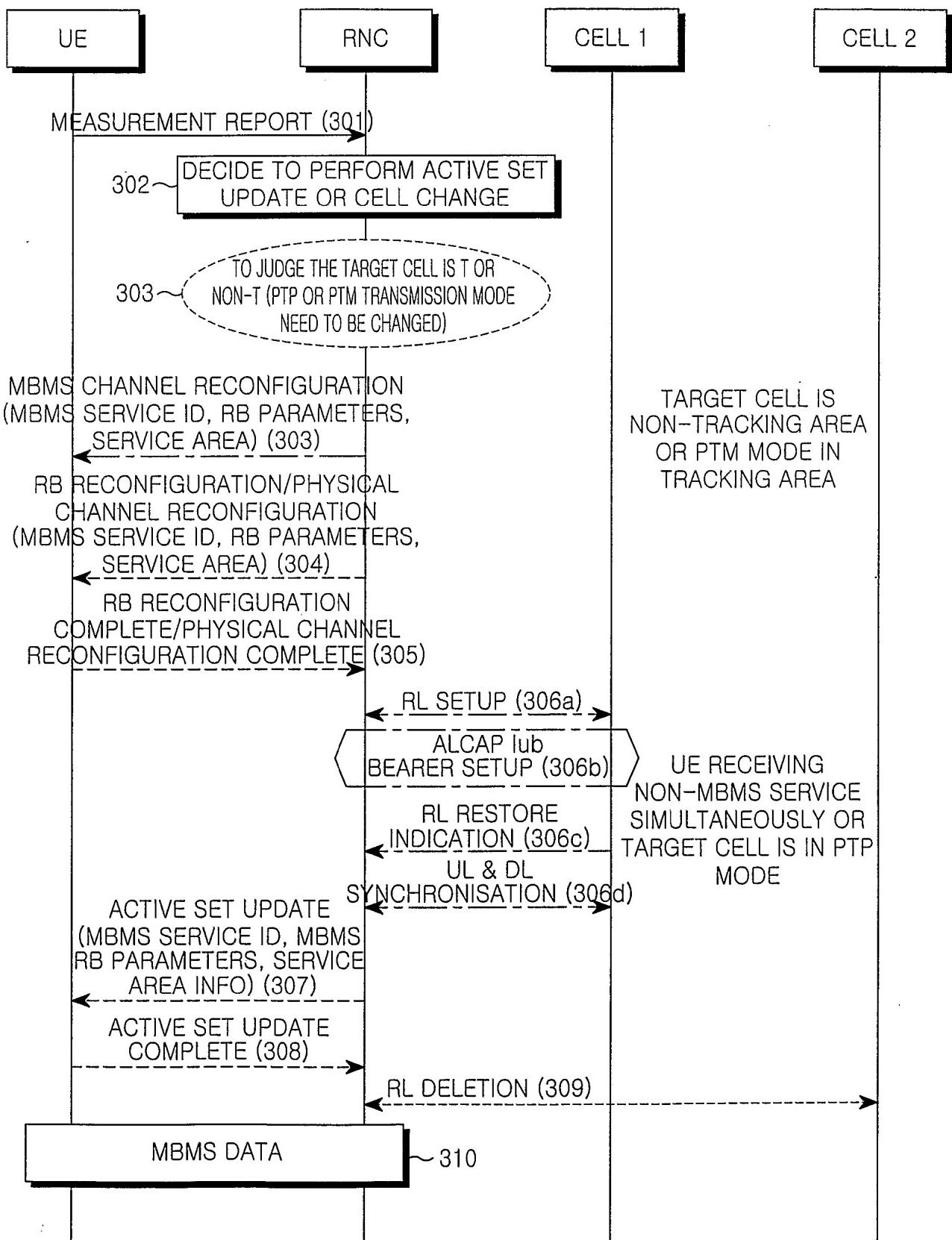


FIG.3

4/5

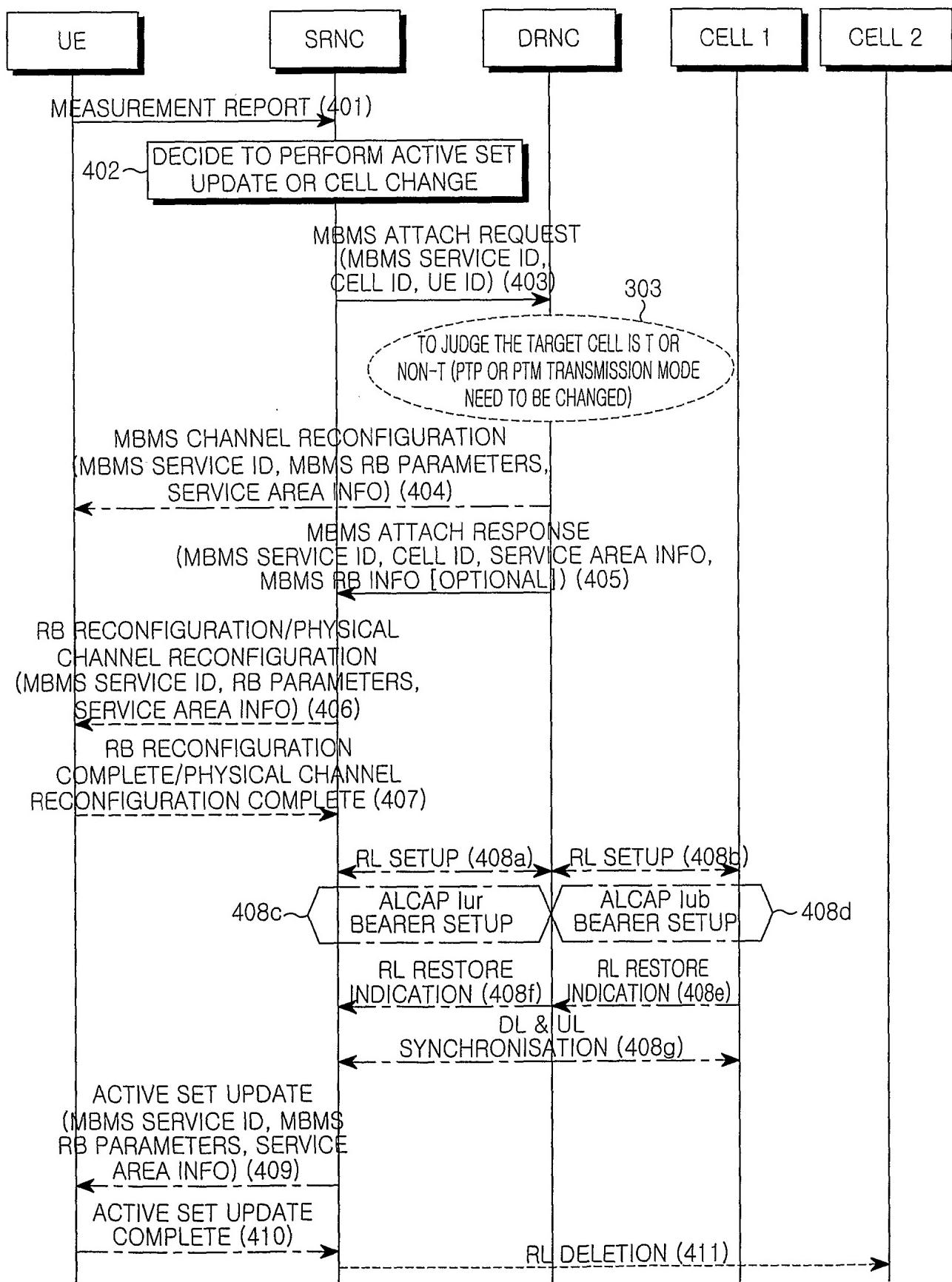


FIG.4

5/5

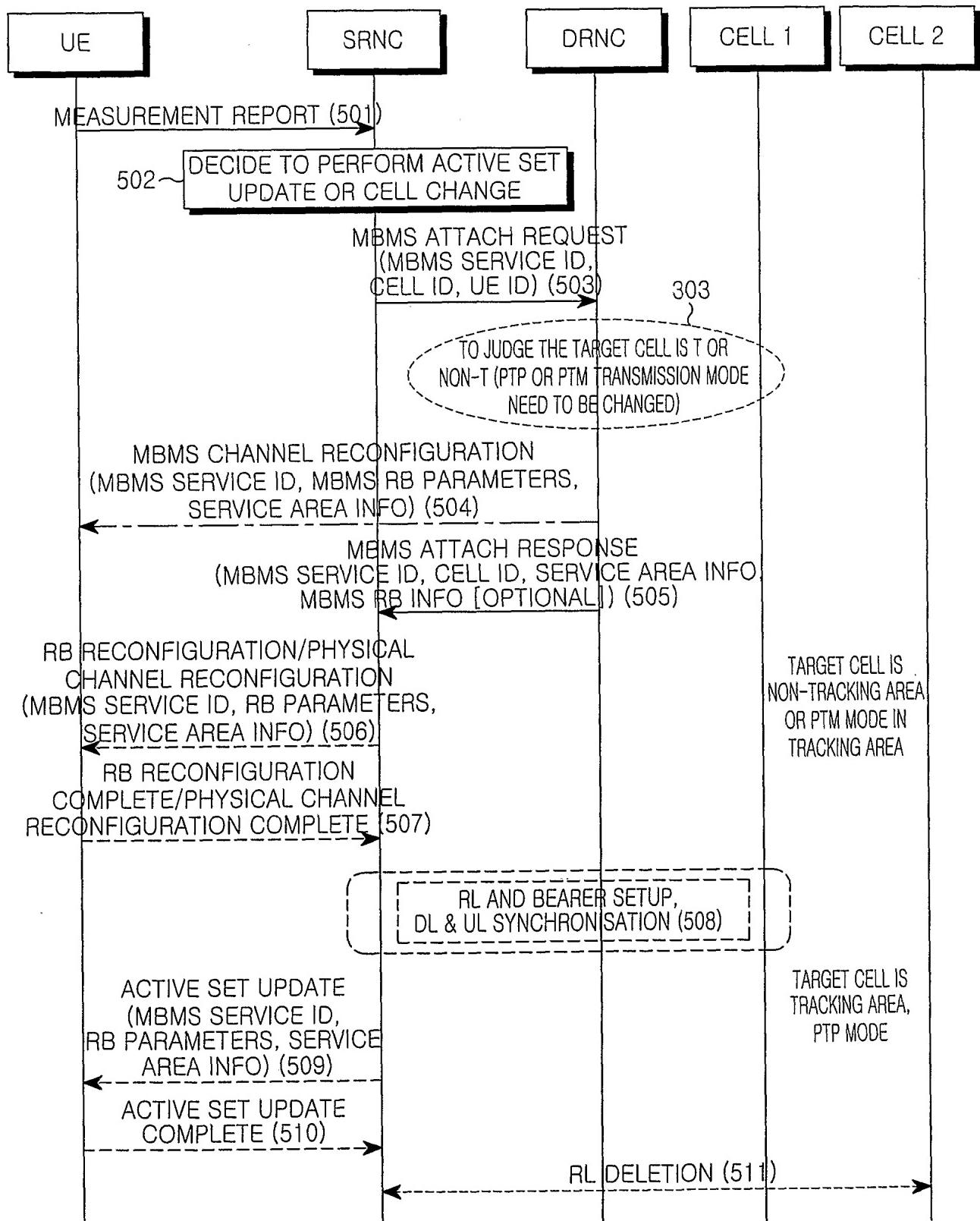


FIG.5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2004/000047

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 H04L 12/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 H04J, H04L, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Patents and applications for inventions since 1975

Korean Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKIPASS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|---|-----------------------|
| A | US 6,466,556 B1 (Nortel Networks Limited) 15 October 2002 (15. 10. 2002) See the whole document | 1 - 33 |
| A | US 5,987,011 A (Chai-Keong Toh, King's College) 16 November 1999 (16. 11. 1999) See the whole document | 1 - 33 |
| A | US 6,438,117 B1 (QUALCOMM Incorporated) 20 August 2002 (20. 08. 2002) See the whole document | 1 - 33 |
| A | US 6,374,112 B1 (Telefonaktiebolaget LM Ericsson (publ)) 16 April 2002 (16. 04. 2002) See the whole document | 1 - 33 |

Further documents are listed in the continuation of Box C.

See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

08 APRIL 2004 (08.04.2004)

Date of mailing of the international search report

08 APRIL 2004 (08.04.2004)

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